FORM PTO-1390 (REV. 11-2000) — US DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	US APPLICATION NO. (If known, see 37 CFR 1.5)
011106	09/869407

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/EP99/09250	11/29/1999	12/23/1998

TITLE OF INVENTION **Flat Storage Element for an X-RAY Image**

APPLICANT(S) FOR DO/EO/US **Thoms**

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [X] This is an express request to begin national examination procedures (35 U.S.C. 371 (f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. [X] The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [ ] is attached hereto (required only if not communicated by the International Bureau).
   b. [X] has been communicated by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [X] An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. [X] is attached hereto.
   b. [ ] has been previously submitted under 35 U.S.C. 154(d)(4).
7. [X] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
   a. [ ] are attached hereto (required only if not communicated by the International Bureau).
   b. [ ] have been communicated by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [X] have not been made and will not be made.
8. [ ] An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. [X] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. [ ] An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. [ ] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [x] A FIRST preliminary amendment.
14. [ ] A SECOND or SUBSEQUENT preliminary amendment.
15. [ ] A substitute specification.
16. [ ] A change of power of attorney and/or address letter.
17. [ ] A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. [X] A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. [ ] A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. [X] Other items or information: **Return Postcard, Certificate of Express Mail**

U.S. APPLICATION NO (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
09/869407	PCT/EP99/09250	011106

21. [X] The following fees are submitted:

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

		CALCULATIONS PTO USE ONLY
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO	$1,000.00	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO	$860.00	
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO	$710.00	
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4)	$690.00	
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4)	$100.00	

ENTER APPROPRIATE BASIC FEE AMOUNT =	$860.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).		

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	$	
Total claims	13 - 20 =	0	x **$18.00**	$0.00	
Independent claims	1 - 3 =	0	x **$80.00**	$0.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$270.00**	$0.00	
TOTAL OF ABOVE CALCULATIONS =				$860.00	
[ ] Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.					
SUBTOTAL =				$860.00	
Processing fee of **$130.00** for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				$0.00	
TOTAL NATIONAL FEE =				$860.00	
Fee for recording the enclosed assignment (37 CFR 1.21 (h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$0.00	
TOTAL FEES ENCLOSED =				$860.00	
				Amount to be refunded:	$
				charged:	$

a. [X] A check in the amount of $860.00 to cover the above fees is enclosed.

b. [ ] Please charge my Deposit Account No. 50-0545 in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 50-0545. A duplicate copy of this sheet is enclosed.

d. [ ] Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:
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SIGNATURE

Jovan N. Jovanovic
NAME

40039
REGISTRATION NUMBER

IN THE
UNITED STATES
PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: Thoms

CASE: 011106

PRELIMINARY AMENDMENT

SERIAL NO.:

FILED ON: June 22, 2001

FOR: Flat Storage Element for an X-Ray Image

ASSISTANT COMMISSIONER
FOR PATENTS
Washington DC 20231

ATTENTION OF:

EXAMINER:

Dear Sir:

If any charges or fees must be paid in connection with the following communication, they may be paid out of our Deposit Account No. 50-0545.

Please enter the foregoing preliminary amendment **PRIOR** to calculation of filing fees and substantive examination of the claims.

FACTOR & PARTNERS, LLC
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Jody L. Factor 34157
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IN THE CLAIMS AMEND

4. (once amended) Storage element according to claim 1, characterised in that the binding agent (22) is a transparent plastics material with a refractive index of between 1.4 and about 1.6.

5. (once amended) Storage element according claim 1, characterised in that the refractive index of the material of the storage particles (20) and/or the refractive index of the binding agent (22) is isotropic.

6. (once amended) Storage element according to claim 1, characterised by an anti-reflection coating (14) borne by the front surface of the storage layer (12).

7. (once amended) Storage element according to claim 1, characterised in that the rear side of the storage layer (12) bears an absorbing layer (16) which absorbs the activating light.

8. (once amended) Storage element according to claim 1, characterised in that on the rear side of the storage layer (12) a reflecting layer (16) is provided, which reflects the fluorescent light and is preferably connected firmly to the storage layer (12).

9. (once amended) Storage element according to claim 1, characterised in that behind the storage layer (12) is arranged a protective layer (18) of material absorbing X-ray beams, in particular a metal layer consisting of a metal with high order number such as lead.

11. (once amended) Storage element according to claim 1, characterised in that the storage layer

(12) and/or the anti-reflection coating (14) and/or the absorbing layer (16) and/or the reflecting layer (16) and/or the protective layer (18) form a bendable layered structure.

12. (once amended) Method for producing a storage element according to claim 1, characterised in that binding agent (22) is prepared in the liquid state and the storage particles (20) are dispersed in the liquid binding agent (22), and that the material obtained in this way is dispersed to form a thin film-type layer and the binding agent is then cured.

REMARKS

Under the new rules, attached hereto is a copy of the claims including amendments made thereto. In light of the foregoing, Applicant submits that the application should be in condition for calculation of filing fees and substantive examination at the present time.

Should anything further be required, a telephone call to the undersigned, at (312) 226-1818, is respectfully invited.

Respectfully submitted,

FACTOR & PARTNERS, LLC

Dated: June 22, 2001

Jovan N. Jovanovic
One of Attorneys for Applicant

AMENDED CLAIMS WITH MARKINGS TO SHOW CHANGES

4. (once amended) Storage element according to [one of claims 1 to 3] claim 1, characterised in that the binding agent (22) is a transparent plastics material with a refractive index of between 1.4 and about 1.6.

5. (once amended) Storage element according to [one of claims 1 to 4] claim 1, characterised in that the refractive index of the material of the storage particles (20) and/or the refractive index of the binding agent (22) is isotropic.

6. (once amended) Storage element according to [one of claims 1 to 5] claim 1, characterised by an anti-reflection coating (14) borne by the front surface of the storage layer (12).

7. (once amended) Storage element according to [one of claims 1 to 6] claim 1, characterised in that the rear side of the storage layer (12) bears an absorbing layer (16) which absorbs the activating light.

8. (once amended) Storage element according to [one of claims 1 to 7] claim 1, characterised in that on the rear side of the storage layer (12) a reflecting layer (16) is provided, which reflects the fluorescent light and is preferably connected firmly to the storage layer (12).

9. (once amended) Storage element according to [one of claims 1 to 8] claim 1,

characterised in that behind the storage layer (12) is arranged a protective layer (18) of material absorbing X-ray beams, in particular a metal layer consisting of a metal with high order number such as lead.

11. (once amended) Storage element according to [one of claims 1 to 10] claim 1, characterised in that the storage layer (12) and/or the anti-reflection coating (14) and/or the absorbing layer (16) and/or the reflecting layer (16) and/or the protective layer (18) form a bendable layered structure.

12. (once amended) Method for producing a storage element according to [one of claims 1 to 11] claim 1, characterised in that binding agent (22) is prepared in the liquid state and the storage particles (20) are dispersed in the liquid binding agent (22), and that the material obtained in this way is dispersed to form a thin film-type layer and the binding agent is then cured.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

I, Ian McBride, MA(Edin)., MITI., declare

1. That I am a citizen of the United Kingdom of Great Britain and Northern Ireland, residing at 15 Chaffinch Road, Beckenham KENT BR3 4LT.
2. That I am well acquainted with the English and German languages.
3. That the attached is a true translation into the English language of International Patent Application No. PCT/EP99/09250.
4. That all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such wilful false statements may jeopardise the validity of the patent application in the United States of America or any patent issuing thereon.

Signed, this 24th day of May 2001

IAN McBRIDE

Flat storage element for an X-ray image

The invention relates to a flat storage element for an X-ray image according to the preamble of claim 1.

Storage elements of this kind are obtainable commercially as so-called storage films.

With such storage films the storage layer formed by storage particles and a binding agent matrix is optically inhomogeneous, and there occurs as a result of said inhomogeneities a scattering of the activating light, which is used for reading out the latent image, and also a scattering of the measuring light read out. The resolution of the storage element is consequently influenced disadvantageously.

The above-mentioned scatter effects are the stronger the smaller the storage particles are. Small storage particles are conversely advantageous, however, with respect to high resolution of the storage element.

There is therefore to be created by the present invention a storage element according to the preamble of claim 1 which is optically homogeneous, so that no scattering of activating light and measuring light takes place in the storage layer.

This object is achieved according to the invention by a storage element with the features given in claim 1.

With the storage element according to the invention the refractive indices of the storage particles on the one hand

and of the binding agent on the other are adjusted to one another. The optical inner boundary surfaces at which the scattering of activating light and measuring light takes place therefore disappear. The whole of the storage layer behaves optically like a single-component material.

An improved resolution is thus obtained with the storage element according to the invention.

Advantageous developments of the invention are given in sub-claims.

If according to claim 2 different salts crystallising together are used for the storage particles, the refractive index may be adjusted simply within very wide limits. It is possible by corresponding variation of the ratio in which the two salts are provided to cover a wide range of binding agent refractive indices, to attain exactly the refractive index of a predetermined binding agent.

A refractive index of preferably between 1.4 and 1.6 is selected for the binding agent according to claim 6. A large number of different salt compositions is then available with which said range of the refractive index may be realised, so that a selection may be made from said large number in terms of other parameters to be included, e.g. the size of the particular unit cell of the salt which influences the preferred excitation wavelength of the colour centres formed.

The development of the invention according to claim 7 also prevents small residual scattering of the light, such as would be caused by an anisotropic material.

The development of the invention according to claim 8 prevents a deterioration in the resolution, such as would be obtained by reflections on the front boundary surface of the storage layer viewed in the direction of motion of the light.

With the development of the invention according to claim 9, reflections of activating light on the rear side of the storage layer are eliminated. A further improved spatial resolution of the X-ray image read out is thereby obtained.

With a storage element according to claim 10 the yield of fluorescent light is improved, since the light radiated into the rear half-space is reflected towards the front side. The sensitivity of the storage film is improved by a factor of 2 in this way.

The development of the invention according to claim 11 is of advantage in terms of minimising the radiation load on a patient whose teeth are X-rayed with a storage element held behind the jaw.

The development of the invention according to claim 12 is of advantage in terms of a simple handling of the storage element. The whole of the storage element may thus also be bent without fold formation

A storage element as given in claim 13 may be adapted effectively to curved surfaces, e.g. the curvature of a jaw.

The method given in claim 14 ensures that the binding agent also fits exactly positively in microscopic terms around the storage particles. No small air inclusions or cavities therefore arise, which in turn could again represent scatter centres.

The invention will be explained in detail below from embodiments with reference to the drawing. In the latter:

Figure 1 shows an enlarged section through a bendable storage element for use in the X-raying of teeth, which is placed perpendicular to the plane of the storage element,

Figure 2 shows a view onto the storage element, such as is obtained if the refractive indices of storage particles and binding agents of the storage element are different,

Figure 3 shows a similar view to Fig. 2, such as is obtained if the refractive indices of storage particles and binding agents are equal and

Figure 4 shows a graphic representation of the refractive indices of selected transparent plastics materials.

Fig. 1 shows a section through a flexible storage element 10 which may be used instead of a conventional tooth film during the x-raying of teeth. The storage element has a central storage layer 12 whose composition will be described in even greater detail below, a front anti-reflection coating 14, a rear reflecting/absorbing

layer 16 and a lead film 18 also lying behind the latter. The reflecting/absorbing layer 16 reflects fluorescent light such as is given out of the storage element during the point-by-point reading out using a laser beam, and absorbs the laser excitation light which is used for the point-by-point reading out of the storage element. Consequently the fluorescent light generated in the interior of the storage element 10 is emitted completely towards the front side of the storage element 10.

The reflective layer may be formed by a corresponding interference layer. It may also for its part be produced from two sub-layers lying one behind the other, e.g. a front sub-layer, which is responsible for the reflection of the fluorescent light, and a second, rear sub-layer, which absorbs the laser excitation light.

A metal such as aluminium may be used for the reflecting sub-layer. Said layer may then simply be vapour-deposited onto the rear side of the storage layer 12. Instead of this it is also possible to use a diffusely reflecting powder layer as reflecting sub-layer, which consists e.g. of $BaSO_4$ powder. $BaSO_4$ is characterised by a particularly high reflection factor for light of the wavelengths of interest here.

The various layers are connected to form a one-piece layered structure, wherein the connection between the storage layer 12 and the anti-reflection coating 14 or the absorbing layer 16 is obtained by in-situ application of the two last-mentioned layers, e.g. by evaporation or by printing on of a corresponding ink and vaporising of the

solvent etc.. The lead film 18 may be connected to the rear side of the absorbing layer 16 by a thin layer of adhesive.

The storage layer 12 comprises a large number of storage particles 20 which are shown simplified in the drawing as small spheres, but in reality have an irregular geometry such as is obtained by the fine grinding of salt. The storage particles 20 are held together by a transparent binding agent 22 which is preferably a transparent organic binding agent that is selected from the group given in Table 1 below:

Table 1

Class	Representative	Abbreviation
Polyolefins	Polyethylene	PE
	Polypropylene	PP
	special polyolefins	PB, PMP
Vinyl chloride polymers	Polyvinyl chloride, rigid	PVC-U
	Polyvinyl chloride, flexible	PVC-P
Styrene polymers	Polystyrene	PS
	Styrene-butadiene	SB
	Styrene-acrylonitrile	SAN
	Acrylonitrile-butadiene-styrene	ABS
	SAN with acrylic elastomer	ASA
Cellulose esters	Cellulose ester	CA,CP,CAB
Polymethyl methacrylate	Polymethyl methacrylate	PMMA
Polyamides	Polyamide 6	PA6
	Polyamide 66	PA66
	Polyamide 11, polyamide 12	PA11,PA12
	Polyamide amorphous	PA6-3-T

Polyacetals	Polyoxymethylene	POM
Linear polyesters	Polyethylene terephthalate	PETP
	Polybutylene terephthalate	PBTP
Polycarbonate	Polycarbonate	PC
Polyphenylene oxide	Polyphenylene oxide modified	PPO
Special plastics	Polysulphones	PSU, PES
	Polyphenylene sulphide	PPS
	Polyimides	PI
	Silicone resin materials	SI
Fluorine-containing polymers	Polytetrafluoroethylene	PTEE
	Fluorine-containing thermoplastics	FEP, PFA ETFE, PVDF, PVF
Phenoplastics	Phenoplastics	PF
Aminoplastics	Melamine resins	MF
	Urea resins	UF
Unsaturated polyesters	Unsaturated polyesters	UP
Epoxy resins	Epoxy resins	EP

The refractive index for the above-mentioned plastics for visible light is shown in Figure 4 of the drawing.

In Figure 4 the binding agents which are crystal clear are provided additionally with a star.

The storage particles 20 consist of a material in which metastable excited states are generated by interaction with impinging X-ray beams. Said metastable states have typically a life of at least a few minutes. Because activating light is irradiated into the absorption bands of said metastable states, an unstable excited state may be

obtained, which then passes into the ground state with the emission of fluorescent light.

Suitable metastable states are based in practice on defects in the crystal lattice, which are formed inter alia by lattice defects or else impurity atoms. Thus in alkali halide crystals, for example, anion defects may store electrons metastably, which are accelerated during the X-ray absorption, and form so-called colour centres. Holes may form metastable states in said metals in V-centres or on impurity atoms.

The capacity to generate a latent X-ray image in the storage layer 12 is attributable to the colour centres of the storage particles 20. The refractive index which the activating light sees or the fluorescent light triggered by the latter sees, depends first and foremost on the macroscopic refracting angle index of the storage particles 20 or of the binding agent 22.

Because the two refractive indexes are adjusted to one another, the scattering of the activating light and of the fluorescent light, which is generated by emptying of a metastable state with the use of activating light, is prevented. The fluorescent light detected with a photodetector, which forms part of a reproduction device for latent X-ray beams, may therefore be correlated precisely with the radiated point-by-point read-out surface of the storage element.

The adjustment of the refractive indices of storage particles 20 and binding agent 22 may in the case of alkali halides be produced within wide limits by specific choice

of the basic material for storage particles 20. Table 2 below gives an overview of the refractive indices of pure alkali halides:

Table 2

	F	Cl	Br	I
Li	1.3915	1.662	1.784	1.955 (3)
Na	1.327	1.5442	1.6412	1.7745
K	1.363	1.490	1.559	1.677
Rb	1.398	1.493	1.5530	1.6474
Cs	1.478(5)	1.6418	1.6984	1.7676

Since the alkali halides are all miscible with one another over a wide range (same crystal class), the refractive index of the mixed crystal obtained may be varied within wide limits by the mixing of two different salts. If, for example, a mixed crystal of KCl and RbBr is considered and the composition of the mixed crystal is written as $K_xRb_{1-x}Cl_yBr_{1-y}$, where x and y each lie in the range between 0 and 1, there is obtained with varying of x and y between 0 and 1 a range of adjustment of the refractive index of 1.490 to 1.559.

If defects are formed in said mixed crystal, e.g. by the addition of 0.1 mol % Tl^+, because of the small concentration, the doping has only a small effect on the refractive index of the mixed crystal of not more than 0.1%.

A second means of securing the adjustment of the refractive index is the selection of the binding agent, wherein different refractive indices are obtained for different

binding agents in accordance with the nature of the monomers. For some of the binding agents the refractive index may again be varied within a range by influencing the chain length and the cross-linking. This is discernible from the representation of the refractive index for various plastics materials which is reproduced in Figure 4.

Typically the diameter of the storage particles comes to about 10 µm, the thickness of the storage layer to 100 µm.

It is further seen from Figure 4 that glasses are also considered as binding agents, wherein the refractive index may be adjusted over a greater range by means of the composition of the glasses.

In terms of the robustness of the storage element and in terms of a manufacturability of the storage elements at not excessively high temperatures, organic binding agents are preferred.

The anti-reflection coating is produced in the conventional manner, e.g. by the evaporation of material with suitable refractive index and in suitable thickness. The absorbing layer 16 is manufactured of a material absorbing the laser light used for the reading out of the latent image and may likewise be vapour-deposited or printed on as ink.

In Figure 2 the various storage particles 20 appear as phase objects. There is therefore obtained there microscopically the same image as that of glass beads placed in a glass of water.

Because the refractive index of storage particles 20 and binding agent 22 are adjusted to one another, said phase objects disappear and there is obtained for the storage element the appearance reproduced in Figure 3: the latter behaves for the laser light used for the reading out of the latent X-ray image like homogeneous slab glass.

As already mentioned above, the storage particles have in reality the shape of ground material with small bevels. In order also to obtain an embedding of the storage particles in the binding agent which is free of microscopic cavities, the following procedure is adopted during the production of the storage layer 12:

Binding agent 22 is prepared in the liquid state. The storage particles 20 are distributed homogeneously in the liquid binding agent 22. The material obtained in this way is brushed out to a thin layer and the binding agent is then cured, so that a storage film with corresponding thickness is obtained.

The binding agent is further preferably prepared in the highly liquid state, to which end it is diluted and/or heated.

Claims

1. Flat storage element for an X-ray image, with a large number of storage particles (20) which may be placed by means of X-ray light in metastable excitation states that are convertible by irradiation with activating light into an unstable excitation state which is in turn decomposed with the radiation of fluorescent light, and with a transparent binding agent (22) by means of which the storage particles (20) are held together to form a storage layer (12), wherein the binding agent (22) and the storage particles (20) have substantially the same refractive index, characterised in that the storage particles (20) consist of a transparent salt material which comprises two salts chemically different but crystallising in the same crystal structure, wherein the salts form a mixed crystal.

2. Storage element according to claim 1, characterised in that the salts differ in their cations and/or anions.

3. Storage element according to claim 2, characterised in that the cations are halide ions.

4. Storage element according to one of claims 1 to 3, characterised in that the binding agent (22) is a transparent plastics material with a refractive index of between 1.4 and about 1.6.

5. Storage element according to one of claims 1 to 4, characterised in that the refractive index of the material of the storage particles (20) and/or the refractive index of the binding agent (22) is isotropic.

6. Storage element according to one of claims 1 to 5, characterised by an anti-reflection coating (14) borne by the front surface of the storage layer (12).

7. Storage element according to one of claims 1 to 6, characterised in that the rear side of the storage layer (12) bears an absorbing layer (16) which absorbs the activating light.

8. Storage element according to one of claims 1 to 7, characterised in that on the rear side of the storage layer (12) a reflecting layer (16) is provided, which reflects the fluorescent light and is preferably connected firmly to the storage layer (12).

9. Storage element according to one of claims 1 to 8, characterised in that behind the storage layer (12) is arranged a protective layer (18) of material absorbing X-ray beams, in particular a metal layer consisting of a metal with high order number such as lead.

10. Storage element according to claim 9, characterised in that the protective layer (18) is connected firmly to the storage layer (12), e.g. with the use of an adhesive layer (16) which preferably simultaneously assumes the function of the absorbing layer (16) according to claim 7.

11. Storage element according to one of claims 1 to 10, characterised in that the storage layer (12) and/or the anti-reflection coating (14) and/or the absorbing

Amended sheet

layer (16) and/or the reflecting layer (16) and/or the protective layer (18) form a bendable layered structure.

12. Method for producing a storage element according to one of claims 1 to 11, characterised in that binding agent (22) is prepared in the liquid state and the storage particles (20) are dispersed in the liquid binding agent (22), and that the material obtained in this way is dispersed to form a thin film-type layer and the binding agent is then cured.

13. Method according to claim 12, characterised in that the binding agent (22) is prepared in the highly liquid state, to which end it is diluted and/or heated.

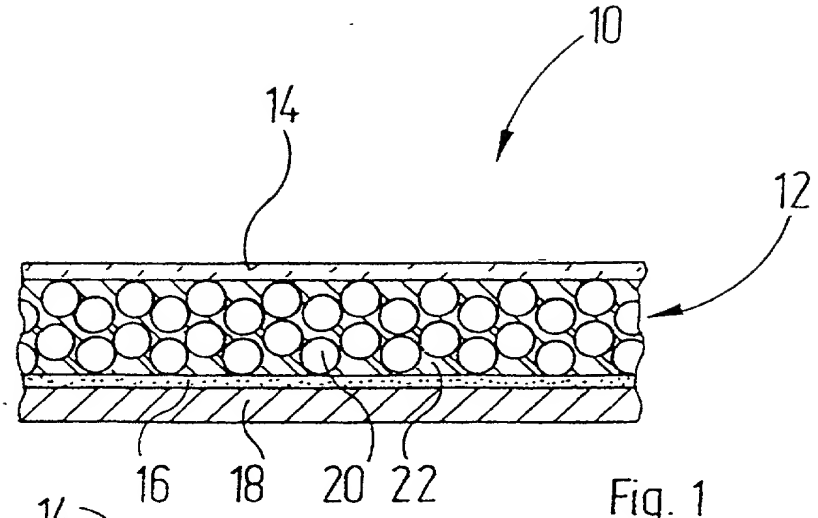

Fig. 1

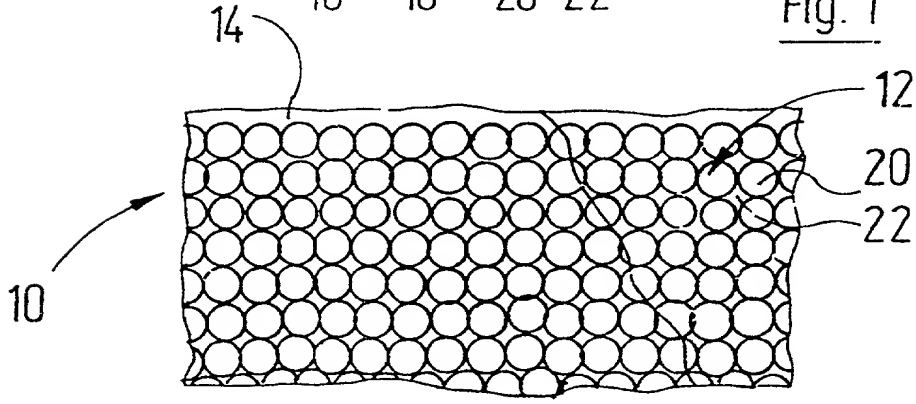

Fig. 2

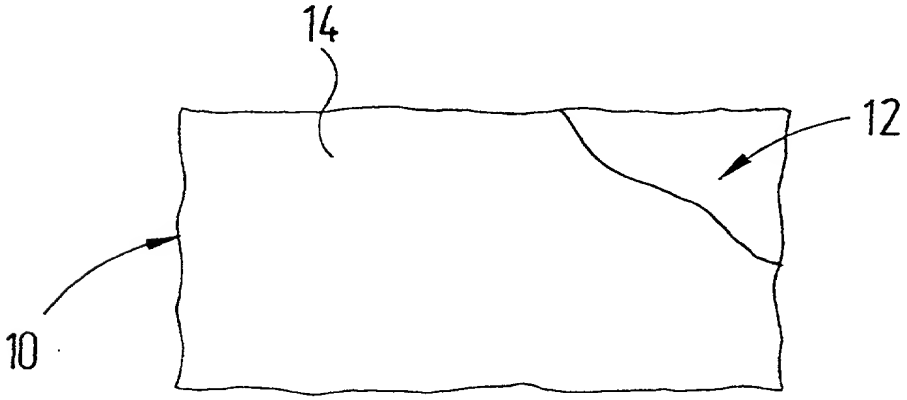

Fig. 3

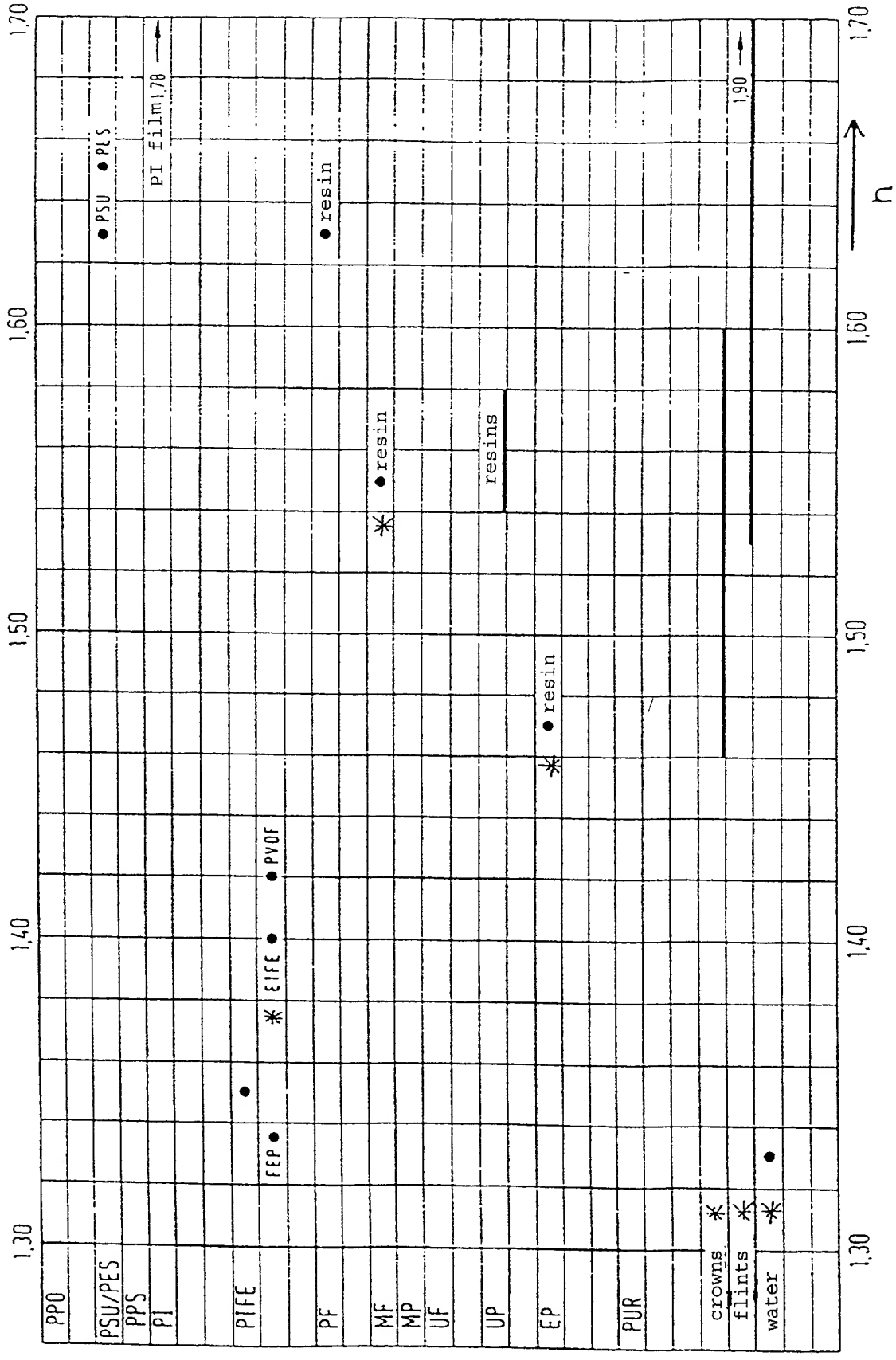

Fig. 4 (upper section)

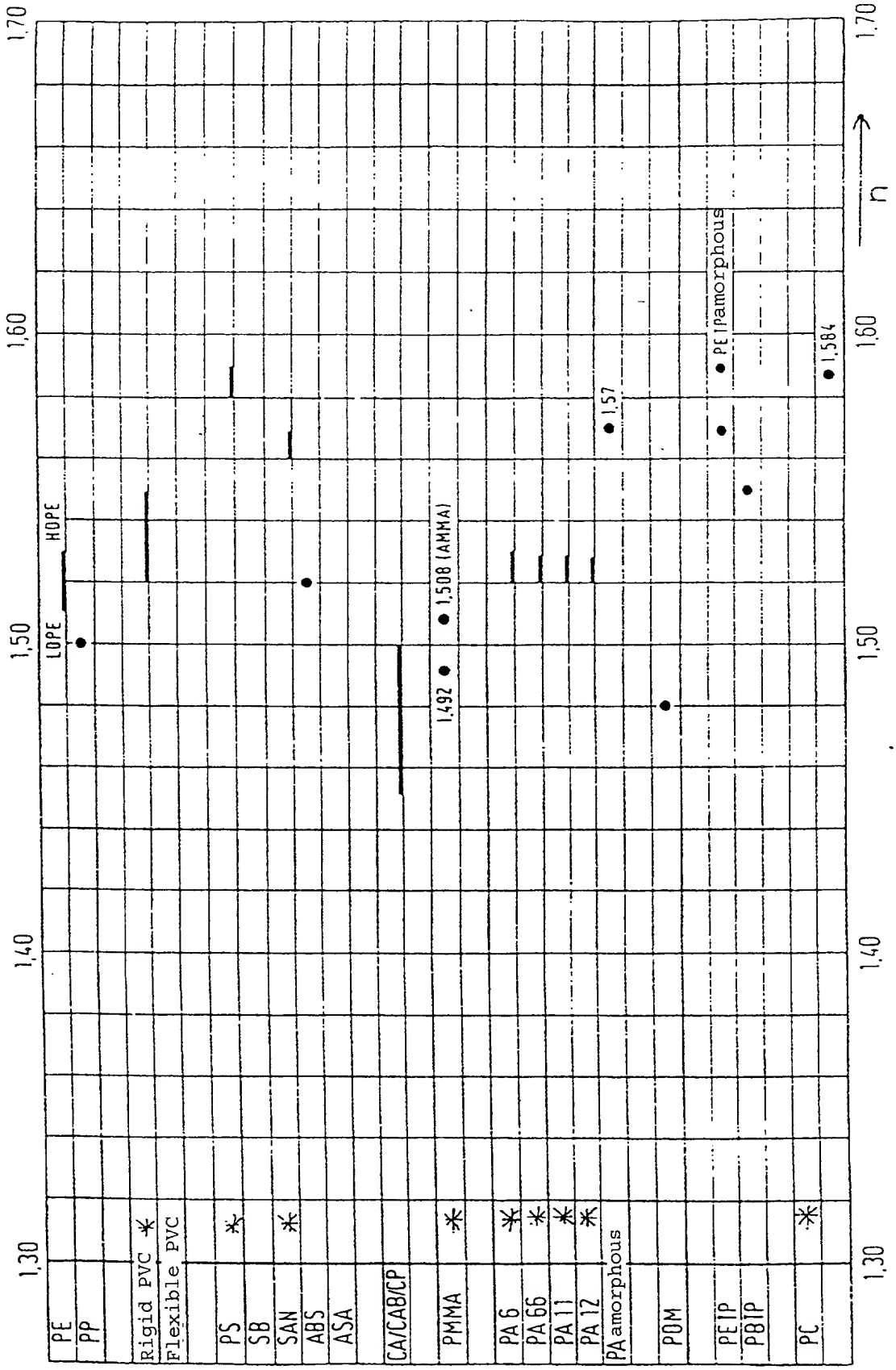

Fig. 4 (lower section)

7615.3

Please type a plus sign (+) inside this box → ☐

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☐ Declaration Submitted with Initial Filing **OR** ☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number	
First Named Inventor	Thoms
COMPLETE IF KNOWN	
Application Number	
Filing Date	
Group Art Unit	
Examiner Name	

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Flat Storage Element for an X-RAY Image

the specification of which *(Title of the Invention)*

☐ is attached hereto
OR

☒ was filed on (MM/DD/YYYY) 11/29/1999 as United States Application Number or PCT International Application Number PCT/EP99/09250 and was amended (MM/DD/YYYY) 7/20/2000 (If applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	Certified Copy Attached? NO
198 59 880.7	DE	12/23/1998	☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)

☐ Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

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DECLARATION — Utility or Design Patent Application

I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)
PCT/EP99/09250	11/29/1999	

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

☐ Customer Number → ☐ Place Customer Number Bar Code Label here

OR

☐ Registered practitioner(s) name/registration number listed below

Name	Registration Number	Name	Registration Number
Jody L. Factor	~~34157~~		
Jovan N. Jovanovic	~~40039~~		
William L. King	~~46830~~		

☐ Additional registered practitioner(s) named on supplemental Registered Practitioner Information sheet PTO/SB/02C attached hereto.

Direct all correspondence to: ☐ Customer Number or Bar Code Label ☐ OR ☐ Correspondence address below

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])	Family Name or Surname
Michael	Thoms

Inventor's Signature						Date	28.04.01
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City	Bietigheim-Bissingen	State		Zip	D-74321	Country	Germany

☐ Additional inventors are being named on the ____ supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto